

# Chemical analysis of threatened and endangered species in San Diego Bay:

## San Diego Bay Trophic Transfer Project

Progress Report, July 2009

Primary Investigator: Dr. Rebecca Lewison, San Diego State University



<b>Grantee Organization</b>	San Diego State University
<b>Project end date</b>	Dec 31, 2009
<b>Grant Title</b>	Chemical analysis of threatened and endangered species in San Diego: San Diego Bay Trophic Transfer Project
<b>Primary Investigator</b>	Dr. Rebecca Lewison

**EXECUTIVE SUMMARY**

- The focus of this grant is to **use isotope and elemental analyses to describe trophic linkages and to understand how that relates to transfer of contaminants in San Diego Bay**, focusing on two endangered species East Pacific green turtle and California Least Terns. The research team currently includes two SDSU faculty (Lai & Lewison), a senior NOAA scientist (Seminoff), collaborative efforts of a senior Scripps Institute scientist (Deheyn), graduate students (Fournier, Komoroske & Gaos) and a number of project interns who are current students or recent undergraduates from UCSD and SDSU.
- The key focus of the last 6 months has been collecting the last field samples, analyzing these most-recently collected samples (to date, we have analyzed over 400 samples), re-running samples where necessary and initiating preliminary data analyses. The secondary metal analyses have been completed as well.
- To address standing budget questions, a budget reallocation proposal was submitted on 7/23 that justified and annotated all spending on the budget date. This also included a request to adjust budget amounts per category.

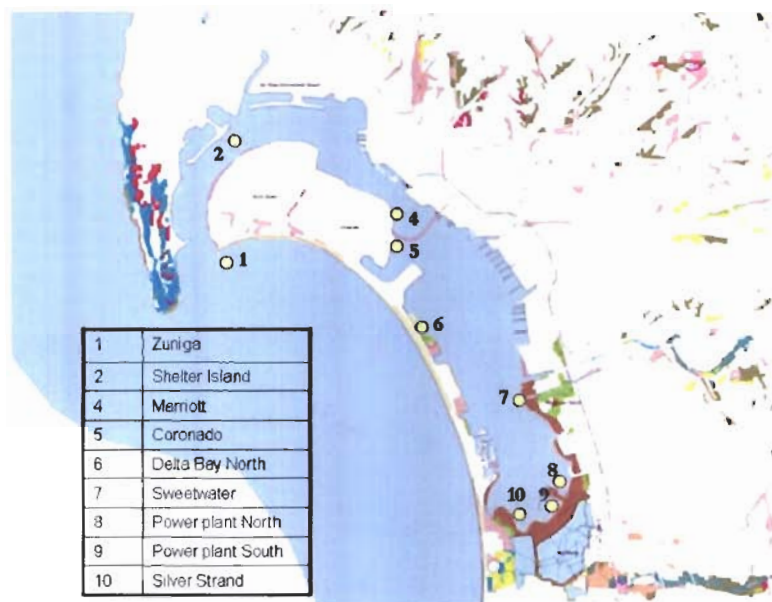
**In the final stage of the project, we will be analyzing data, and writing up our results (as a final report to the Port and peer-reviewed manuscripts). Despite some minor delays due to laboratory equipment, the project is progressing well and following the anticipated timeline.**

**PROGRESS TO DATE**

**Field data collection**

All necessary biological samples have been collected from the nine permanent sampling sites throughout the Bay (Fig. 1) which were designed to represent the stratified ecoregions from the

State of the Bay Report (2007). Our sample regime was designed to capture spatial (inter-site) and temporal (seasonal) variability. Turtle samples (blood and scutes) were collected through May 2009 for isotope and metal analyses.



**Figure 1.** Nine permanent sampling sites

<i>Scientific name</i>	<i>Common Name</i>
<i>Zostera marina</i>	Eelgrass
<i>Gracillaria</i> spp	-
<i>Ulva</i> spp.	-
<i>Zoobotryon verticillatum</i>	-
Ascidians	Sponge/Tunicates
<i>Aplysia californica</i>	Sea hare
<i>Ptilosarcus</i> spp.	Sea pen
<i>Antherinops affinis</i>	Topsmelt
<i>Engraulis mordax</i>	Calif. anchovy
<i>Cymatogaster aggregata</i>	Surfperch

**Table 1.** Target species

### *Database*

All samples have been catalogued in a single database. This includes data collected from this project, by Komoroske and Fournier, and isotope data from SWFSC. This large dataset allows for comparisons across years (using SWFSC data), sites, taxa and species.

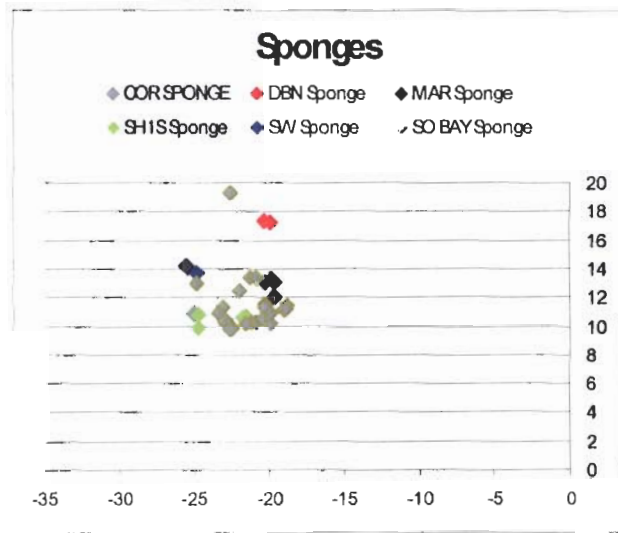
### **Chemical analyses**

#### *Stable isotopes*

More than 300 isotope samples have been run. These samples include eelgrass and two other types of vegetation, invertebrates, fish, and turtle blood and tissue. We may need to re-run some additional samples depending on the data we receive from the lab. Sample re-runs are a very common practice for this type of analysis and a suite of factors explain why these additional analyses may be necessary.

In our last report we highlighted initial interpretation of our isotope analyses that pointed to some interesting patterns. The evidence of nitrogen enrichment throughout the Bay continues to grow based on our sample results. Nutrient over-enrichment is most likely a result of deposition and

run-off and may point to a critical concern for San Diego Bay. As we continue to analyze these samples, we will be focusing specifically on the role that nitrogen enrichment may be playing in the Bay and for green turtles and terns.



**Fig. 2** Stable isotope data for sponge species. Delta carbon value are in the X axis and delta nitrogen on the Y axis. Although certain species have shown little variability among sites, there is some indication of significant differences in isotope signatures from Site 6 (labeled DBN in Fig 2).

### *Elemental analyses (trace metals)*

Trace metal analyses were completed at Scripps with some additional analyses being conducted at CSU, Long Beach. Results from these analyses are being analyzed to identify concentration levels, enrichment factors and bioaccumulation levels in the samples. We are waiting to receive the results from the metal speciation tests. Metal speciation is a process by which the specific form of an element can be determined and can be used to identify particular cellular pathways that the trace metal may be affecting. This second level of metal analysis moves beyond simply detecting elevated levels of particular compounds but identify the potential mechanism by which a toxic compound may be impacting the species of interest. For this analysis, we are using plasma from the turtle blood samples collected in 2007-2008.

As with the isotope samples, low percent recoveries on standard reference material (which typically point to an equipment hiccup), may require some re-running of analyzed samples.

Sample re-runs are a very common practice for this type of analysis and a suite of factors explain why these additional analyses may be necessary.

<b>NEXT STEPS</b>
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- Stable isotope and trace metal analysis are complete for all 2008 and 2009 samples, although we are still waiting to receive the results from two different labs with the results from the most-recently collected samples.
- We have begun and will continue to analyze these data, paying particular attention on nitrogen enrichment across trophic levels.
- Once data analyses are complete, we will initiate product production, including maps, a final report and peer-reviewed manuscripts
- We are making good progress and are following our anticipated timeline.